

REMARKS

Applicant's Statement of Substance of Interview.

Applicants wish to express appreciation to Examiners Virginia M. Kibler and Mehrdad Dastouri for the courtesy of an interview which was granted to Applicant's representative Michael Faibisch (Reg. No. 48,427). A personal interview was conducted at the USPTO on October 21, 2004. The substance of the interview is set forth in the Interview Summary, numbered Paper No. 9. During the interview, the independent claims were discussed vis-à-vis the Neubauer, Roder, Hara and Caspi prior art. Proposed amendments were discussed, but no agreement was reached.

General Remarks

Claims 1 – 87 are pending in the application. Claims 25, 34, 35, 77 and 78 are previously presented and Claims 1, 26, 29, 31, 44, 69, 72 and 74 are currently amended. No impermissible new matter has been added.

Applicant has carefully studied the outstanding Office Action in the present application. The present response is intended to be fully responsive to all points of rejection raised by the Examiner and is believed to place the application in condition for allowance. Favorable reconsideration and allowance of the application are respectfully requested.

Claims Rejections

Claims 29 and 72 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Neubauer ("Intelligent X-Ray Inspection for Quality Control of solder Joints").

Claims 1, 3-5, 14-16, 44, 46-48 and 57-59 stand rejected under 35 U.S.C. 103(a) as being

unpatentable over Neubauer ("Intelligent X-Ray Inspection for Quality Control of solder Joints") in view of Roder (6,373,917).

Claims 30 and 73 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Neubauer ("Intelligent X-Ray Inspection for Quality Control of solder Joints") as applied to claims 29 and 72, and further in view of Caspi et al. (5,774,573).

Claims 8-10, 17-23, 51-53 and 60-66 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Neubauer ("Intelligent X-Ray Inspection for Quality Control of solder Joints") and Roder (6,373,917) as applied to Claims 1 and 44, and further in view of Caspi et al. (5,774,573).

Claims 2, 6, 7, 24, 25, 45, 49, 50, and 67 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Neubauer ("Intelligent X-Ray Inspection for Quality Control of solder Joints") and Roder (6,373,917) as applied to Claims 1 and 44, and further in view of Hara et al. (4,692,690).

Claims 68 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Neubauer ("Intelligent X-Ray Inspection for Quality Control of solder Joints"), Roder (6,373,917) and Hara et al. (4,692,690) as applied to Claim 67, and further in view of Bishop et al. (5,524,152).

Claims 11-13 and 54-56 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Neubauer ("Intelligent X-Ray Inspection for Quality Control of solder Joints"), Roder (6,373,917) and Hara et al. (4,692,690) as applied to Claim 6 and 49, and further in view of Caspi et al. (5,774,573).

Claims 26, 27, 31, 32, 34-43, 69, 70, 74, 75, 77-87 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Hara et al. (4,692,690) in view of Caspi et al. (5,774,573).

Claims 28, 33, 71, and 76 stand rejected under 35 U.S.C. 103(a) as being unpatentable

over Hara et al. (4,692,690) in view of Caspi et al. (5,774,573) as applied to Claims 26, 31, 69 and 74, and further in view of Elyasaf et al. (6,175, 645).

Neubauer (“Intelligent X-Ray Inspection for Quality Control of solder Joints”) describes automated X-ray inspection of solder joints for inline process monitoring and quality control. Computer tomography, or laminography, is employed to separate images of solder joints on opposite sides of a double-sided board.

Roder (6,373,917) describes Z-axis elimination in an X-ray laminography system using image magnification for Z plane adjustment.

Caspi et al. (5,774,573) describes an automatic visual inspection system in which a binary map of an object having edges is produced by first producing a digital gray scale image of the object with a given resolution and then processing the digital gray scale image to produce a binary map of the object at a resolution greater than the given resolution.

Hara et al. (4,692,690) describes a pattern detecting apparatus for inspecting a printed wiring board in which an image formed by fluorescent light and an image formed by reflected light are both used. The images are compared to each other to detect pattern defects.

Bishop et al. (5,524,152) describes a method of and apparatus for object or surface inspection employing multicolor reflection discrimination.

Elyasaf et al. (6,175, 645) describes an optical inspection method and an apparatus having upper and lower faces. First and second images, formed, respectively by reflected and transmitted light components, are acquired and analyzed so as to provide data indicative of defects.

Applicant has amended Claims 1 and 44 to recite that the second image data, employed to modify first image data to produce an enhanced representation of an electrical circuit, includes

“at least some image data for an optical characteristic that is different from said first image data”. Support for the amendment may be found at Figs. 1 and 2, and at paragraphs 104 – 105, and at paragraph 113 of the written specification.

As noted above, Neubauer employs computer tomography, or laminography, to enhance images of electrical circuit parts of interest by removing those sections of a 3-D image corresponding to electrical circuit parts causing artifacts. The image data in Neubauer used to enhance a first image is different from the first image data because it corresponds to a different electrical circuit part. However, nothing in Neubauer shows or suggests modifying first image data using at least some image data for an optical characteristic that is different from the first image data, as required by Claims 1 and 44. Nothing in Roder, or in the other cited art of record, remedies this deficiency.

Applicant has amended Claims 26 and 69, which now include the recitation, “providing an enhanced contrast representation of the electrical circuit by non-linearly combining said first image data and said second image data” and “applying said enhanced contrast representation to a third representation of the electrical circuit to provide an enhanced inspection representation for use in inspecting said electrical circuit for defects.” Support for the amendment may be found at Figs. 3-4 and the accompanying description at paragraphs 136 – 163 of the written specification.

Caspi et al. (5,774,573) describes a non-linear methodology using two versions of the same image of an electrical circuit for forming an enhanced resolution map of the electrical circuit. Hara et al. (4,692,690) describes a pattern detecting apparatus for inspecting a printed wiring board by comparing a fluorescent light image to a reflected light image. Nothing in the combination of Hara et al. and Caspi et al. shows or suggests the methodology of first providing an enhanced contrast representation by non-linearly combining two different images, and then

applying the enhanced contrast representation to a third representation of the electrical circuit to provide an enhanced inspection representation for use in inspecting said electrical circuit for defects, as required in Claims 26 and 69. Nothing in the other prior art of record remedies this deficiency.

Applicant has amended Claims 29 and 72 to recite that image data is enhanced using “different optical data for an optical characteristic that is different from an optical characteristic of said image data to provide enhanced inspection output information”. Support for the amendment may be found at Figs. 1 - 3, and at paragraphs 104 – 105, paragraph 113 and paragraphs 136 – 140 of the written specification.

As noted above, Neubauer employs computer tomography, or laminography, to enhance images of electrical circuit parts of interest by removing those sections of a 3-D image corresponding to electrical circuit parts causing artifacts. However, nothing in Neubauer shows or suggests enhancing image data using different optical data for an optical characteristic that is different from an optical characteristic of the image data, to provide enhanced inspection output information, as required in Claims 29 and 72. Nothing in the other cited art of record remedies this deficiency.

Claims 31 and 74 have been clarified by self-explanatory correction, and include the following distinguishing recitation, “non-linearly combining said first image data and said second image data to form a pseudo image, and supplying said pseudo image to a high-sure/low-sure region classifier.”

In the non-linear image combination of Caspi et al. only one image is acquired. Nothing in the combination of Caspi et al. and Hara et al. shows or suggest the non linear combination of first and second image data to form a pseudo image, and then supplying the pseudo image to a

high-sure/low-sure region classifier, and nothing in the other prior art of record remedies this deficiency.

With reference to the above discussion, independent Claims 1, 26, 29, 31, 44, 69, 72 and 74 are deemed allowable and favorable reconsideration is respectfully requested. Claims 2 – 25, 27 – 28, 30, 32 – 43, 45 – 68, 70 – 71, 73, and 75 – 86 each depend directly or ultimately from one of independent Claims 1, 26, 29, 31, 44, 69, 72, deemed allowable, and recite additional patentable subject matter and therefore are also deemed allowable.

In view of the foregoing, all of the claims are deemed to be allowable. Favorable reconsideration and allowance of the application is respectfully requested.

Conclusion and Request for Interview

In view of the foregoing, this application is believed to be in order. Reconsideration and allowance of this application are respectfully solicited.

If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly invited to contact the undersigned attorney at the telephone number listed below.

Respectfully submitted,

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